existence is evident. *Anthea cereus*, which contains most algæ, probably far outnumbers all the other species of sea-anemones put together, and the Radiolarians which contain yellow cells are far more abundant than those which are destitute of them. So, too, the young gonophores of Velella, which bud off from the parent colony and start in life with a provision of *Philozoon* (far better than a yolk-sac) survive a fortnight or more in a small bottle—far longer than the other small pelagic animals. Such instances, which might easily be multiplied, show that the association is beneficial to the animals concerned.

The nearest analogue to this remarkable partnership is to be found in the vegetable kingdom, where, as the researches of Schwendener, Bornet, and Stahl have shown, we have certain algæ and fungi associating themselves into the colonies we are accustomed to call lichens, so that we may not unfairly call our agricultural Radiolarians and anemones *animal lichens*. And if there be any parasitism in the matter, it is by no means of the alga upon the animal, but of the animal, like the fungus, upon the alga. Such an association is far more complex than that of the fungus and alga in the lichen, and indeed stands unique in physiology as the highest development, not of parasitism, but of the reciprocity between the animal and vegetable kingdoms. Thus, then, the list of supposed chlorophyll-containing animals with which we started, breaks up into three categories: first, those which do not contain chlorophyll at all, but green pigments of unknown function (*Bonellia*, *Idotea*, &c.); secondly, those vegetating by their own intrinsic chlorophyll (*Convoluta*, *Hydra*, *Spongilla*); thirdly, those vegetating by proxy, if one may so speak, rearing copious algæ in their own tissues, and profiting in every way by the vital activities of these.

PATRICK GEDDES

SCIENTIFIC SERIALS

Journal of the Royal Microscopical Society for December, 1881, contains:—Diatoms from Peruvian guano, by Rev. L. G. Mills (plate xi.).—B. W. Richardson, on multiple staining and the usual summary of current researches relating to zoology and botany (principally Invertebrata and Cryptogamia). — Microscopy.—This part concludes volume i. ser. ii., and is accompanied by a very excellent index to the 980 pages, a list of authors, and full tables of contents.

Transactions and Proceedings of the New Zealand Institute for 1880, vol. xiii. Wellington, April, 1881.—In this large volume of over 460 pages, in addition to a short account of the proceedings of most of the scientific societies of New Zealand, the following memoirs are published *in extenso*:—*Astronomical*: H. Skey, on periodic vertical oscillations in the Sun's atmosphere, and their connection with the appearance and disappearance of of the solar spots.—M. Chapman, on the permanency of solar and stellar heat.—A. W. Bickerton, on the causes tending to alter the eccentricity of planetary orbits,—On the origin of the solar systems.—On the origin of double stars.—On a simple method of illustrating the motions of the earth.—On the probability of impact.—*Zoological*: Julius von Haast, on *Balænoptera huttoni*, Gray.—On Harpagornis (3rd paper).—W. Arthur, on migratory salmon.—Dr. Hector, on a new fish.—F. E. Clark, on a new species of Trachypterus.—F. W. Hutton, contributions to New Zealand Malacology.—G. M. Thomson, New Zealand crustacea.—T. F. Cheeseman, new species of mollusca.—Prof. Liversidge, analysis of Moa egg-shell.—Capt. Broun, description of coleopterous larvæ and pupæ.—T. W. Kirk, notes on birds.—On crustacea.—P. Buller, on new diurnal moths.—W. L. Buller, a new lizard.—T. Jeffery Parker, a new species of Chirodota.—On the venous system of the skate.—*Botanical*: W. Colenso, on the vegetable food of the ancient New Zealanders.—On the ferns of Scinde Island (Napier).—On some new ferns of New Zealand.—On a new species of Metzgeria.—G. M. Thomson, on fertilisation in New Zealand flowers.—On *Donatia novæ-zealandiæ*.—Dr. Berggren, on New Zealand plants.—T. F. Cheeseman, on the fertilisation of Thelymitra.—On a new Loranthus.—W. M. Marskell, New Zealand Desmids.—T. A. Mollet, on the structure of *Hormosira billardieri*.—Dr. Petrie, flora of Stewart Island.—On a new Carex.—T. B. Armstrong, on the genus Corallospartium.—On new or rare New Zealand plants.—On the occurrence of the Morel.—On a natural arrangement of the New Zealand ferns.—T. Kirk, some new plants.—Charles Knight, on a new Thysanothecium.—*Chemical*: W. Skey, on an allotropic form of zinc and cobalt salts.—On a periodide and an iodo-carbonate of lead.—On the dimorphism of magnesia.—*Geological*: A. D. Dobson, on a dyke near Heathcote.—A. Hamilton, on the Foraminiferæ of the tertiary beds at Petane.—A. M'Kay, on the genus Rhynconella.—S. Percy Smith, on changes in coast line level in the north of the North Island.—T. A. Mollet, on an artesian well at Avonside.—This volume is illustrated with eighteen lithographic plates.

Zeitschrift für wissenschaftliche Zoologie, Bd. 36, Part 2 (Nov. 1881), contains:—Prof. Hubert Ludwig, on the history of the development of the skeleton in Ophiuroids (plates x. and xi.).—Dr. Julius Andreæ, contribution to the anatomy and histology of *Sipunculus nudus*, L. (plates xii. and xiii.).—Dr. F. Mayser, comparative anatomy studies on the brain of osseous fishes, with especial reference to the Cyprinoids (plates xiv. to xxiii.).

Atti della R. Accademia dei Lincei, vol. vi., fasc. 1.—The reactions of biliary pigments, by S. Capranica.—Synthesis of naphtil-acrylic acid, by F. Lugli.—Researches on the spider's web, by L. Valente.—On the light of the comet, by L. Respighi.

Atti della R. Accademia dei Lincei, vol. vi., fasc. 2.—On bilinear quaternary forms, by G. Battaglini.—On the origin of some linear differential equations, by S. Brioschi.—On the discharges of condensers, by Srs. Villari and Righi.—The endoptic perception of colour at the back of the eye, by C. Emery.—Contribution to the anatomy of leaves, by G. Briosi.—On dimethylnaphthaline, by G. Giovanozzi.—Reports, &c.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December 8, 1881.—"On the Structure and development of *Lepidosteus*," by F. M. Balfour, LL.D., F.R.S., and W. N. Parker.

The first section of this paper is devoted to the general development. In this section an account is given of the structure of the ripe ovum, of the segmentation, of the history of the germinal layers, of the first development of the principal organs, and of the external features of the embryo during embryonic and larval life. The more important points established in this section are—

1. The ovum when laid is invested by a double covering formed of (*a*) a thick inner membrane, the outer zone of which is radially striated, and (*b*) an outer layer made up of highly refractive pyriform bodies, which are probably metamorphosed follicular epithelial cells.

2. The segmentation is complete, though very unequal, the lower pole being very slightly divided up into segments, and its constituent parts fusing together again to form an unsegmented mass of yolk, like the yolk-mass of Teleostei.

3. The epiblast is divided into an epidermic and nervous stratum, as in Teleostei.

4. The walls of the brain, spinal cord, and optic vesicle are formed from a solid medullary keel, like that found in Teleostei.

5. The lens, the auditory vesicle, and olfactory pit, are wholly developed from the nervous layer of the epidermis.

6. The segmental or archinephric duct is developed as in Teleostei, from a hollow ridge of the somatic mesoblast, which becomes constricted off, except in front, thus forming a duct with an anterior pore leading into the body cavity.

The section on the general development is followed by a series of sections on the adult anatomy and development of various organs.

The Brain.—The authors give a fuller description of the adult brain than has previously been given. The new features in this description are (1) that the parts identified by previous anatomists as the olfactory lobes are really parts of the cerebral hemispheres, the true olfactory lobes being small prominences at the base of the olfactory nerves; (2) that there is attached to the roof of the thalamencephalon a peculiar vesicle, which has not hitherto been noticed, but which is similar to the vesicle found by Wiedersheim on the roof of the thalamencephalon of Protopterus. They further show that the cerebrum is divided into a posterior portion, with an unpaired ventricle, and an anterior portion in which the ventricle is paired. They consider the presence of the portion of the cerebrum with an unpaired ventricle to be an indication that this part of the brain retains characters which are only found in the embryonic brain of other groups. They point to ths presence of lobi inferiores on the

infundibulum, of tori semicirculares in the mid-brain, and of a large cerebellum as indications of an affinity between the brain of Lepidosteus and that of Teleostei. In the embryological section full details are given as to the development of the thalamencephalon, the pineal gland, the cerebrum, and the olfactory lobes.

Organs of Special Sense: Eye.—In the adult eye a vascular membrane is described bounding the retinal aspect of the vitreous humour. This membrane is supplied by an artery piercing the retina close to the optic nerve, and the veins from it fall into a circular vessel placed at the insertion of the iris. The membrane itself is composed of a hyaline ground substance with numerous nuclei. In the developmental section devoted to the eye the main subject dealt with is the nature of the mesoblastic structures entering the cavity of the optic cup, through the choroid slit. It is shown that a large non-vascular mesoblastic process first enters the optic cup, and that together with the folded edge of the choroid slit it forms a rudimentary and provisional processus falciformis. At a later period an artery, bound up in the same sheath as the optic nerve, enters the optic cup, and the vascular membrane found in the adult then becomes developed.

The Suctorial Disk.—The structure of a peculiar larval suctorial organ placed at the end of the snout is described, and the organ is shown to be formed of papillæ constituted by elongated epidermic cells, which are probably glandular (modified mucous cells), and pour out a viscid secretion.

Muscular System.—The lateral muscles of Lepidosteus are shown to differ from those of other fishes, except the Cyclostomata, in not being divided into a dorso-lateral and ventro-lateral group on each side of the body.

Vertebral Column and Ribs.—The early stages in the development of the vertebral column are similar to those in Teleostei; the vertebræ being at first biconcave, and the notochord vertebrally constricted. Subsequently an invertebral growth of cartilage takes place, derived from the neural and hæmal arches, and gives rise to invertebral constrictions of the notochord.

The embryological part of this section is followed by a comparative part treated under three headings. In the first of these the vertebral column of Lepidosteus is compared with that of other forms; and it is pointed out that there are grave difficulties in the way of comparing the vertebræ of Lepidosteus with those of some Urodela in the fact that in Lepidosteus the intervertebral cartilages originate from the bases of the arches, while in the Urodela they are stated by Götte to be thickenings of a special cartilaginous investment of the notochord, which would seem to be homologous with the cartilaginous sheath placed in Elasmobranchii and Dipnoi *within the membrana elastica externa*.

On the other hand, the development of the vertebræ of Lepidosteus is shown to resemble in most features that of Teleostei, from which it mainly differs in the presence of intervertebral cartilaginous rings.

In the second section, devoted to the homologies of the ribs of Pisces, the conclusions arrived at are as follows:—

The Teleostei, Ganoidei, Dipnoi, and Elasmobranchii are provided with homologous hæmal arches, which are formed by the coalescence below the caudal vein of simple prolongations of the primitive hæmal processes of the embryo.

In the region of the trunk the hæmal processes and their prolongations behave somewhat differently in the different types. In Ganoids and Dipnoi, in which the most primitive arrangement is probably retained, the ribs are attached to the hæmal processes, and are placed immediately without the peritoneal membrane at the insertion of the intermuscular septa. These ribs are in many instances (Lepidosteus, Acipenser), and very probably in all, developed continuously with the hæmal processes, and become subsequently segmented from them. They are serially homologous with the ventral parts of the hæmal arches of the tail, which, like them, are in many instances (Ceratodus, Lepidosteus, Polypterus, and to some extent in Amia) segmented off from the basal parts of the hæmal arches.

In Teleostei the ribs have the same position and relations as those in Ganoids and Dipnoi, but their serial homology with the ventral parts of the hæmal processes of the tail is often (*e.g.* the Salmon) obscured by some of the anterior hæmal arches in the posterior part of the trunk being completed, not by the ribs, but by independent outgrowths of the basal parts of the hæmal processes.

In Elasmobranchii a still further divergence from the primitive arrangement is present. The ribs appear to have passed outwards along the intermuscular septa into the muscles, and are placed between the dorso-lateral and ventro-lateral muscles (a change of position of the ribs of the same nature is observable in Lepidosteus). This change of position, combined probably with the secondary formation of a certain number of anterior hæmal arches, similar to that in the Salmon, renders their serial homology with the ventral parts of the hæmal processes of the tail far less clear than in other types, and further proof is required before such homology can be considered as definitely established.

Under the third heading the skeletal elements supporting the fin-rays of the ventral lobe of the caudal fin of various types of fishes are compared and the following conclusions are arrived at.

1. The ventral lobe of the tail-fin of Pisces differs from the other unpaired fins in the fact that its fin-rays are directly supported by spinous processes of certain of the hæmal arches instead of by independently developed interspinous bones.

2. The presence or absence of fin-rays in the tail-fin supported by hæmal arches may be used in deciding whether apparently diphycercal tail-fins are aborted or primitive.

Urogenital Organs.—With reference to the character of the adult urogenital organs, the authors show that for the female the descriptions of Müller and Hyrtl are substantially accurate, but that Hyrtl's description of the generative ducts of the male is wholly incorrect.

They find that in the male the semen is transported from the testes by means of a series (40—50) of vasa efferentia, supported by the mesorchium. In the neighbourhood of the kidney these vasa unite into a longitudinal canal, from which transverse trunks are given off, which become continuous with the uriniferous tubuli. The semen is thus transported through the kidney into the kidney-duct (segmental duct), and so to the exterior. No trace of a duct homologous with the oviduct of the female was found in the male.

With reference to the development of the excretory system, the authors have established the following points:—

1. That the segmental (archinephric) duct is developed as in Teleostei.

2. That a pronephros, resembling in the main that of Teleostei, is developed from the anterior end of the segmental duct. But they found that the pronephric chambers, each containing a glomerulus, with which the coiled pronephric tube opens, are not, as in Teleostei, completely shut off from the body cavity, but remain in communication with it by two richly ciliated canals, one on each side of the body.

3. The pronephros eventually undergoes atrophy.

4. Some of the mesonephric tubes have peritoneal funnels in the larva.

5. The ovarian sac continuous with the oviduct, is established by a fold of the peritoneal membrane, near the attachment of the mesovarium uniting with the free edge of the ovarian ridge to form a canal, the inner wall of which is constituted by the ovarian ridge itself.

6. The posterior part of the oviduct is not formed until the ovarian sac has become developed, and had not been developed in the oldest larva (11 centims.) the authors have succeeded in obtaining.

The Alimentary Canal and its Appendages.—In this section the authors give a detailed account of the topographical anatomy of the alimentary tract in the adult. They have detected a small pancreas close to the bile-duct, and call special attention to a ventral mesentery passing from the posterior straight section of the intestine to the ventral wall of the body.

In the embryological part of the section a detailed account is given of the development (1) of the pancreas, which is described as emerging as a dorsal diverticulum of the duodenum on a level with the opening of the bile-duct; (2) of the yolk-sac and vitelline duct; (3) of the spiral valve, which first appears as a hollow fold in the wall of the intestine, taking a slightly spiral course, and eventually becoming converted into a simple spiral ridge. The so-called hyoid gill, which the authors expected to find well-developed in the larva, is shown not to be found even in the oldest larva examined (26 millims.)

The last section of the paper is devoted to the consideration of the systematic position of Lepidosteus. The Teleostean affinities of Lepidosteus are brought into prominence, but it is shown that Lepidosteus is nevertheless a true Ganoid.

The arguments used in this portion of the paper do not admit of being summarised.

Geological Society, January 11.—Mr. R. Etheridge, F.R.S., president, in the chair.—Messrs. W. J. Clunies Ross, Joseph William Brown, William Hunter, Henry Tomlinson, and Charles Otto Trechmann, were elected Fellows of the Society.—The following communications were read:—On the chalk masses or boulders included in the contorted drift of Cromer, their origin and mode of transport, by T. Mellard Reade, F.G.S.—Observations on the two types of Cambrian beds of the British Isles (the Caledonian and Hiberno-Cambrian), and the conditions under which they were respectively deposited, by Prof. Edward Hull, LL.D., F.R.S. In this paper the author pointed out the distinctions in mineral character between the Cambrian beds of the North-West Highlands of Scotland and their assumed representatives in the east of Ireland and in North Wales. In the former case, which included the beds belonging to the "Caledonian type," the formation consists of red or purple sandstones and conglomerates; in the latter, which included the beds belonging to the "Hiberno-Cambrian type," the formation consists of hard green and purple grits and slates contrasting strongly with the former in structure and appearance. These differences the author considered, were due to deposition in distinct basins lying on either side of an Archæan ridge of crystalline rocks which ranged probably from Scandinavia through the central highlands of Scotland, and included the north and west of Ireland, with the counties of Donegal, Derry, Mayo, Sligo, and Galway—in all of which the Cambrian beds were absent—so that the Lower Silurians repose directly and unconformably on the crystalline rocks of Laurentian age. As additional evidence of the existence of this old ridge, the author showed that when the Lower Silurian beds were in course of formation, the Archæan floor along the west of Scotland must have sloped upwards towards the east; but he agreed with Prof. Ramsay that the crystalline rocks of the Outer Hebrides formed the western limit of the Cambrian area of deposition, and that the basin was in the form of an inland lake. On the other hand, looking at the fossil evidence both of the Irish and Welsh Cambrian beds, he was of opinion that the beds of this basin were in the main, if not altogether, of marine origin, and that the basin itself had a greatly wider range eastward and southward—the old Archæan ridge of the British Isles forming but a small portion of the original margin.—The Devono-Silurian formation, by Prof. E. Hull, LL.D., F.R.S. The beds which the author proposed to group under the above designation are found at various parts of the British Isles, and to a slight extent on the Continent. The formation is, however, eminently British, and occurs under various local names, of which the following are the principal:—England and Wales—Devonshire: The Foreland Grits and Slates lying below the Lower Devonian beds ("Lynton Beds"). Welsh Borders: "The passage-beds" of Murchison, above the Upper Ludlow Bone-bed, and including the Downton Sandstone, and rocks of the Ridge of the Trichrug. These beds form the connecting link between the Estuarine Devonian beds of Hereford (generally, but erroneously, called the "Old Red Sandstone") and the Upper Silurian Series. South-east of England (Sub-Cretaceous district): The author assumed, from the borings at Ware, Turnford, and Tottenham Court Road described by Mr. Etheridge, that the Devono-Silurian beds lie concealed between Turnford and Tottenham Court Road on the south and Hereford on the north. Ireland—South: "The Dingle beds," or "Glengariff Grits and Slates," lying conformably on the Upper Silurian beds, as seen in the coast of the Dingle promontory, and overlain unconformably by either Old Red Sandstone or Lower Carboniferous beds, 10,000 to 12,000 feet. North: "The Fintona beds," occupying large tracts of Londonderry, Monaghan, and Tyrone, resting unconformably on the Lower Silurian beds of Pomeroy, and overlain unconformably by the Old Red Sandstone or Lower Carboniferous beds, 5000 to 6000 feet in thickness. Scotland: Beds of the so-called "Lower Old Red Sandstone," with fish and crustaceans, included in Prof. Geikie's "Lake Orcadie, Lake Caledonia, and Lake Cheviot," underlying unconformably the Old Red Sandstone and Lower Calciferous Sandstone, and resting unconformably on older crystalline rocks. Thickness in Caithness about 16,200 feet. The author considered that all these beds were representative of one another in time, deposited under Lacustrine or Estuarine conditions, and as their name indicated, forming a great group intermediate between the Silurian on the one hand and the Devonian on the other. He also submitted that their importance, as indicated by their great development in Ireland and Scotland, entitled them to a distinctive name such as that proposed.

Zoological Society, January 17.—Prof. W. H. Flower, F.R.S., president, in the chair.—Prof. A. Newton, F.R.S., exhibited (by favour of Messrs. Hallett and Co.) the skin and bones of the trunk of an example of *Notornis mantelli* recently received from New Zealand. This was stated to be the third example of this almost extinct bird which had been yet obtained.—Mr. W. K. Parker, F.R.S., read a memoir on the structure and development of the skull in the Crocodilia.—Mr. Oldfield Thomas gave an account of a series of Rodents lately collected by Mr. Stolzmann in Northern Peru. The chief interest in the collection was stated to lie in the fine series of Mice of the genera *Hesperomys* and *Holochilus* contained in it.—A communication was read from Mr. T. E. Buckley on the variability of plumage exhibited by the Red Grouse.—A communication was read from Mr. G. B. Sowerby, jun., containing descriptions of some new species of shells in the collection of Mr. J. Cosmo Melvill.—Prof. F. Jeffrey Bell read descriptions of several new or rare species of *Asteroidea* contained in the collection of the British Museum.—A communication was read from Mr. W. L. Distant, containing the characters of some undescribed species of *Cicadidæ* from the Australian and Pacific regions.

Meteorological Society, January 18.—Mr. G. J. Symons, F.R.S., president, in the chair.—The Secretary read the Report of Council for the past year, which showed the Society to be in a very flourishing condition, for while in 1871 the Society continued its work without an office, accessible library, or an assistant secretary, and the number of the Fellows was 314; the staff at present very fully employed consists of an assistant secretary and three computers with 555 Fellows on the roll. The receipts and expenditure in 1871 show a marked contrast to the year just past; the receipts amounted to only 244*l.* against more than 840*l.* in 1881. The expenditure was only 197*l.* against 780*l.* in 1881. The Society also now receives Second Order and Climatological Observations from eighty-three stations, the results of which are published quarterly in the *Meteorological Record*. In addition to the *Quarterly Journal*, two publications have been prepared and issued under the direction of the Council, viz. "Hints to Meteorological Observers, with Instructions for taking Observations and Tables for their Reduction," and "Index to the Publications of the English Meteorological Societies, 1839 to 1881."—The President then delivered his address, which was devoted to the consideration of the present state and future prospects of Meteorology. He began by asking in what respects is our present system of observation capable of improvement? Should it be extended, either as regards distribution of stations, additional instruments, or additional hours of observation? Can any of the millions of entries at present made annually be safely dispensed with? These questions can only be properly answered after considering two others—What observations are being made? and for what object? After referring to the different patterns of barometer and the number of observations made, Mr. Symons said that he is aware there are several grounds upon which the maintenance of numbers of stations in excess of all possible requirements can be defended. In the first place there is the constant difficulty which arises from the removals and deaths of the observers, and from the extension of buildings and growth of trees, &c. This renders it necessary that we should have two or three stations wherever we desire to make sure of a continuous record. But a far better and more scientific plan would be to choose a few unexceptional localities remote from towns, purchase the freehold of a few surrounding acres, erect thereon stations, identical in design and in every respect, and endow them with moderate funds so that the observations may, humanly speaking, be established on an unalterable basis. That would be the way to detect secular changes. For climatic purposes the numerous climatological stations started by the Society are of great value. After speaking of hygrometers, anemometers, and ozonometers the President referred to daily maps of Atlantic weather, which should be on a scale of not less than 1 inch for 100 miles. A compilation of such charts is essentially national work, and falls wholly within the domain of the Government Office. After referring to weather forecasts, the lack of original workers in discussing meteorological observations, the absence of academical encouragement, and the little prospect of those who devote themselves to meteorology obtaining more than a bare livelihood, the President concluded as follows:—"It is just possible that the severe manner in which I have criticised a few of our existing arrangements may have led some one to consider that meteorology is languishing, feeble, or moribund. I believe that the very contrary is the fact; when

a case is weak, one hesitates to point out its weaknesses for fear of a total collapse. No. The Meteorological Society never advanced so rapidly in numbers as it has in the two last years, and if it will but apply the pruning knife to fruitless observations and try to secure the application of more brain power to the many problems yet unsolved, it will contine to receive an ever-increasing amount of recognition and support, and to maintain that high position among kindred societies which it at present holds."—The following gentlemen were elected Officers and Council for the ensuing year:—President, John Knox Laughton, M.A., F.R.A.S., F.R.G.S. Vice-Presidents: William Ellis, F.R.A.S., Rogers Field, B.A., Joseph Henry Gilbert, F.R.S., Baldwin Latham, F.G.S. Treasurer, Henry Perigal, F.R.A.S. Trustees: Hon. Francis Albert Rollo Russell, M.A., Stephen William Silver, F.R.G.S. Secretaries: George James Symons, F.R.S., John William Tripe, M.D. Foreign Secretary, Robert Henry Scott, F.R.S. Council: Edmund Douglas Archibald, M.A., Arthur Brewin, F.R.A.S., John Sanford Dyason, F.R.G.S., Edward Ernest Dymond, Henry Storks Eaton, M.A., Charles Harding, Robert John Lecky, F.R.A.S., William Marcet, F.R.S., Edward Mawley, F.R.H.S., Richard Strachan, George Mathews Whipple, F.R.A.S., Charles Theodore Williams, M.D.

PARIS

Academy of Sciences, January 16.—M. Jamin in the chair.—The following papers were read:—On the velocity of propagation of explosive phenomena in gases, by MM. Berthelot and Vieille. These experiments were fuller and more exact than the former. An explosive mixture of H and O in a straight horizontal lead tube about 40 m. long and 0·005 m. internal diameter, was fired at one end with an electric spark, and the travelling flame broke two electric circuits in passing (by acting on fulminate of mercury). Again, the tube was divided into a series of connected parallel pieces. For both cases the high general average of 2841 m. per second was obtained. The same with a caoutchouc tube (excluding the idea of a vibratory motion of metal inducing rupture of the circuits). With narrower capillary glass tubes the mean was 2341 m. The velocity was not affected by one or other orifice, or both, or neither, being open. The propagation was uniform in the tubes. The velocity was independent of pressure. CO and O gave a velocity of 1089 m., and dilution of the other mixture with air reduced the velocity.—Chemical studies on the skeleton of plants; second part, vasculose, by MM. Frémy and Urbain. Vasculose most abounds in the parts that present resistance or hardness. To get it pure, the authors treat elder pith with weak hydrochloric acid, the ammoniaco-cupric reagent, &c. *Inter alia*, atmospheric oxygen seems, in time, to transform vasculose into resinous acids soluble in alkalies. In reaction of fused alkalies on wood, it is the vasculose only that forms the different ulmic acids; while cellulose produces acetic and oxalic acid. Methylic alcohol is specially generated by vasculose. The composition of vasculose is $C_{36}H_{20}O_{16}$. Many vegetable fibres (hemp, &c.) have a layer of vasculose, the thickness of which has influence in retting, bleaching, and dyeing.—On the mode of publication most favourable to the progress of scientific studies, by M. de Saint-Venant. He urges the printing of mathematical and other works on such paper as will allow of annotations, in ink, by the reader.—On two small epidemics of plague in Khorassan, by M. Tholozan. This region, thought refractory to plague, has been attacked in a way which is apparently not explained by contagion.—M. Hirn gave some account of a controversy between himself and M. Zeuner, relative to steam-engine cylinders.—M. Gaudry was elected Member in Mineralogy, in place of the late M. Sainte-Claire Deville.—On the spherical representation of surfaces, by M. Darboux.—New theorems on the indeterminate equation $ax^4 + by^4 = z^2$, by M. Pepin.—On an extension of the arithmetical notion of genus (continued), by M. Poincaré.—On waves produced in water at rest in a canal, by immersion of a solid cylinder plunged crosswise into the canal, by M. Boussinesq.—Influence of the form of polar surfaces on the explosive potential, by M. Baille. The results with concentric cylinders and spheres of different diameters (exterior to each other) are given. In the latter case, for a given explosive length, the potential is maximum when the spark passes between two spheres of the same diameter; and it departs from the maximum more, the greater the difference of curvature and the higher the potential.—On the essence of savory, by M. Haller.—On a diatomic alcohol derived from β naphtol, by M. Rousseau.—Phosphoric acid in the arable land of the north of France, by M. Ladureau. A farmer at Honplin (Nord), for twenty years grew beet and wheat alternately on the same land, to which he applied, every two years, the *vinasses* (or liquid residue) of a distillery he had, and a very little dung. The beet kept good, but the wheat crop steadily went down. M. Ladureau showed that the ground had too little phosphoric acid. The evil was remedied by large use of soluble and insoluble phosphates of lime.—Discovery of some new genera of fossil mammalia in the deposits of phosphate of lime at Quercy, by M. Filhol. One belongs to the Moschidæ, and is to be placed near Gelocus. The other resembles Cainotherium. The deposits belong to the Upper Eocene.—Anatomical researches on *Spatangus purpureus*, by M. Kœhler.—On the discordance between the respiratory variations of the intracarotidian and the intrathoracic pressure; second note by M. Frédericq.—On the interpretation of the weight of the brain and its applications, by M. Manouvrier. The increase of mass of the body is a cause of increase of absolute, but of diminution of relative, cerebral brain-weight. He offers an explanation of this in mathematical form, based on the fact that the development of the intellectual faculties is not proportional to that of the body. The impossibility of ranking species and individuals hierarchically according to weight of brain did not arise from the imperfection of the term of comparison chosen between the brain and the mass of the body (as some suppose). The author finds a more suitable term in the *skeleton*. The portion of the brain whose development is in ratio of the intellectual faculties serves for classifying hierarchically; man is then above all animals; and different races, &c., take their right places.—Contributions to the geological knowledge of Japan, by M. Metchnikoff show that Japan is not so exclusively volcanic as has been supposed.

VIENNA

Imperial Academy of Sciences, January 5.—V. Burg in the chair.—The following papers were read:—Albert von Ettingshausen, determination of the index of diamagnetism of metallic tungsten in absolute measure.—Dir. Hann, on the temperature of the southern hemisphere.

January 12.—V. Burg in the chair.—The following papers were read:—E. Mach, on the fundamental notions of electrostatics.—G. Gruss, determination of the trajectory of the Comet V. 1877 (it is found to be a parabola).—T. Haubner, on the stationary streaming of electricity through flat-shaped conductors.—A. v. Obermayer, on the diffusion of gases.

Imperial Institute of Geology, January 10.—The anniversary meeting was held.—Franz v. Hauer gave the president's address. Then the following papers were read:—Fr. Kraus, on finds of remains of *Ursus spelæus* in the Dachstein Mountains.—Edm. v. Mojsisowic, on the Russian Triassic formations.—V. Uhlig exhibited geological maps of the North-Eastern Transylvania.

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